

**IN THE CLAIMS:**

Please substitute the following claims for the previous claims.

1. (currently amended) An electron beam treatment apparatus that comprises:

(a) a chamber comprising:

(i) ~~a cathode having a surface of relatively large area that is exposed to an inside of the chamber~~ an exposed surface capable of producing electrons;

(ii) ~~an anode having holes, therein that is disposed inside the chamber and the anode~~ spaced apart from the cathode by a working distance that is greater than a mean free path of the electrons produced by the cathode;

(iii) ~~a wafer holder disposed inside the chamber facing the anode;~~  
and

(iv) a gas inlet to admit gas into the chamber at a gas introduction rate;

(b) a pump to exhaust gas from the chamber at a gas exhaust rate, the gas introduction rate and the gas exhaust rate providing a gas pressure in the chamber;

(c) a source of negative voltage whose output is applied to the cathode to provide a cathode voltage; and

(d) a source of voltage whose output is applied to the anode;  
~~a gas inlet adapted to admit gas into the chamber at an introduction rate; and~~

~~\_\_\_\_\_ a pump adapted to exhaust gas from the chamber at an exhaust rate, the introduction rate and the exhaust rate providing a gas pressure in the chamber;~~

wherein values of the cathode voltage, gas pressure in the chamber, and the working distance are such that there is no arcing between the cathode and anode and at the working distance that is greater than an electron the mean free path of the electrons from the cathode.

2. (currently amended) The apparatus of claim 1 further comprising a source of gas, ~~which source is a source of~~ comprising one or more of Ne, He, Ar, H<sub>2</sub>, O<sub>2</sub>, Kr, Xe, and N<sub>2</sub>.

3. (currently amended) The apparatus of claim 1 wherein a material of the exposed surface of the cathode is selected from the group consisting of Al, Ti, Ni, Si, Mo, graphite, W, Co, and alloys of the foregoing.

4. (original) The apparatus of claim 1 wherein a material of at least a surface of the anode is selected from the group consisting of Al, Ti, Ni, Si, Mo, graphite, W, Co, and of the foregoing.

5. (currently amended) The apparatus of claim 1 wherein the source of negative voltage is capable of providing output voltages in a range from about -.5 KV to about -10 KV.

6. (cancelled)

7. (currently amended) The apparatus of claim 1 wherein the pump provides a gas pressure that is greater than about 40 mTorr.

8. (currently amended) A method of treating a water with an electron beam in operating an electron beam treatment apparatus that includes a chamber; a cathode having one an exposed surface of relatively large area that is exposed to an inside of the chamber that is capable of producing electrons; an anode having holes therein that is disposed inside the chamber and spaced apart from the cathode by a working distance; a wafer holder disposed inside the chamber facing the anode; a source of negative voltage whose output is applied to the cathode to provide a cathode voltage; a source of voltage whose output is applied to the anode; a gas inlet ~~adapted~~ to admit gas into the chamber at an a gas introduction rate from a source of the gas; and a pump ~~adapted~~ to exhaust gas from the chamber at an a gas exhaust rate, the gas introduction rate and the gas exhaust rate providing a gas pressure in the chamber, which method comprises:

placing a wafer on the wafer holder;

maintaining a working distance between the anode and the cathode that is greater than an electron mean free path of electrons produced by the cathode; and

setting the source of negative voltage, the gas introduction rate, the gas exhaust rate, and the working distance to provide values of the cathode voltage, gas pressure, and working distance such that there is no arcing between the cathode and anode ~~and at the working distance that is greater than an electron the~~ mean free path of electrons from the cathode.

9. (original) The method of claim 8 wherein the cathode voltage is in range from about - 5 KV to about -10 KV

10. (currently amended) The method of claim 9 wherein the gas is comprises one or more of: Ne, He, Ar, H<sub>2</sub>, O<sub>2</sub>, Kr, Xe, and N<sub>2</sub>.

11. (original) The method of claim 8 wherein the gas pressure is greater than about 40 mTorr.

12. (new) An electron beam treatment apparatus that comprises:
- (a) a chamber comprising:
    - (i) a cathode capable of producing electrons, the cathode having an exposed surface area of from about 4 square inches to about 700 square inches;
    - (ii) an anode having holes, the anode spaced apart from the cathode by a working distance in a range of from 10 to 20 mm;
    - (iii) a wafer holder facing the anode; and
    - (iv) a gas inlet to admit gas into the chamber at a gas introduction rate;
  - (b) a pump to exhaust gas from the chamber at a gas exhaust rate, the gas introduction rate and the gas exhaust rate providing a gas pressure in the chamber;
  - (c) a source of negative voltage whose output is applied to the cathode to provide a cathode voltage; and
  - (d) a source of voltage whose output is applied to the anode.
13. (new) The apparatus of claim 12 further comprising a source of gas comprising one or more of Ne, He, Ar, H<sub>2</sub>, O<sub>2</sub>, Kr, Xe, and N<sub>2</sub>.
14. (new) The apparatus of claim 12 wherein a material of the exposed surface area of the cathode is selected from the group consisting of Al, Ti, Ni, Si, Mo, graphite, W, Co, and alloys of the foregoing.
15. (new) The apparatus of claim 12 wherein a material of at least a surface of the anode is selected from the group consisting of Al, Ti, Ni, Si, Mo, graphite, W, Co, and of the foregoing.
16. (new) The apparatus of claim 12 wherein the source of negative voltage is capable of providing output voltages in a range from about -.5 KV to about -10 KV.

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17. (new) The apparatus of claim 12 wherein the gas pressure is greater than about 40 mTorr.

18. (new) The apparatus of claim 12 wherein the wafer holder is for a 300 mm wafer.